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IS 4423 (1999): Hand-sawing of timber - Guide [CED 9: Timber and Timber Stores]

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लकड़ी की हाथ से चिराई हेतु मार्गदर्शिका

(पहला पुनरीक्षण)

Indian Standard

HAND-SAWING OF TIMBER — GUIDE

(First Revision)

ICS 79.040.25.080.60

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 1999

Price Group 5

Timber Sectional Committee, CED 9

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Timber Sectional Committee had been approved by the Civil Engineering Division Council.

A large volume of timber in India is still sawn by hand. For economical hand-sawing of timber and also for reducing the wastage of timber to minimum during such sawing, good practices with improved techniques suitable for different species of timber are needed. This standard has, therefore, been prepared to outline these methods of hand-sawing of timber and also takes into account the use of different types of saws for different purposes.

In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

This standard was first published in 1967. In this revision recommended practices for proper sharpening of saws have been modified. Tools required for maintenance of saws have been updated with the relevant Indian Standards wherever available. Further, based on the experience gained common sawing defects and their causes, instructions on use and care of files used for maintenance of saws and cares of saws are included.

The composition of technical committee responsible for the formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HAND-SAWING OF TIMBER — GUIDE

(First Revision)

1 SCOPE

This standard covers the different types of saws and their maintenance and general principles of conversion of logs during hand-sawing.

2 NORMATIVE REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 707 and the following shall apply.

3.2 Conversion

The process of sawing logs and flitches into smaller sections.

3.3 Gauge (of the Saw Blade)

Thickness of a saw blade.

3.4 Gullet

The space between two consecutive saw teeth (*also* known as throat of a tooth) (*see* Fig. 1 and 2).

3.5 Jointing

Process of equalising heights of cutting teeth in a saw.

3.6 Kerf

Width of the cut made by saw.

3.7 Kerf Loss

Loss of timber due to width of saw cut.

3.8 Peg Teeth

The teeth of a saw which are similar to each other and have the form of triangles (*see* Fig. 1).

3.9 Raker Teeth

Those teeth of a saw which are designed to sever the fibre and to remove saw dust from the kerf (*see* Fig. 2).

3.10 Saw

A thin steel blade with toothed edge used for cutting of timber.

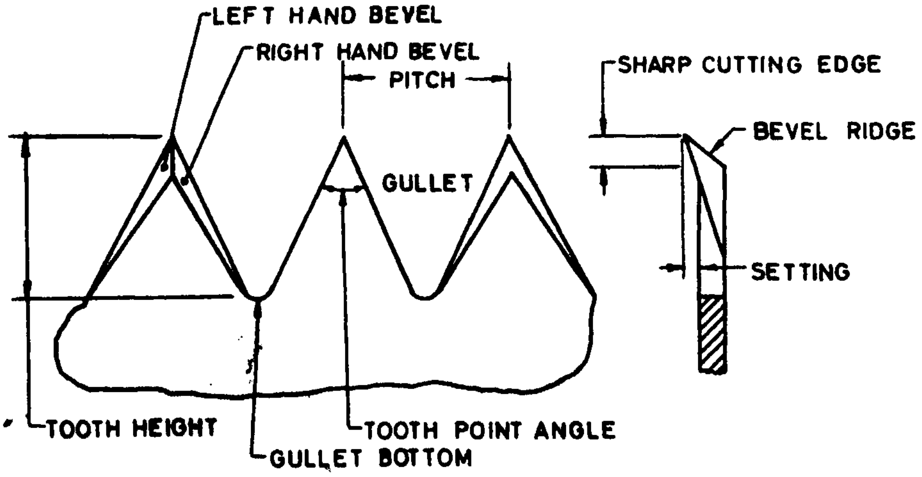


FIG. 1 DETAILS OF PEG TOOTH

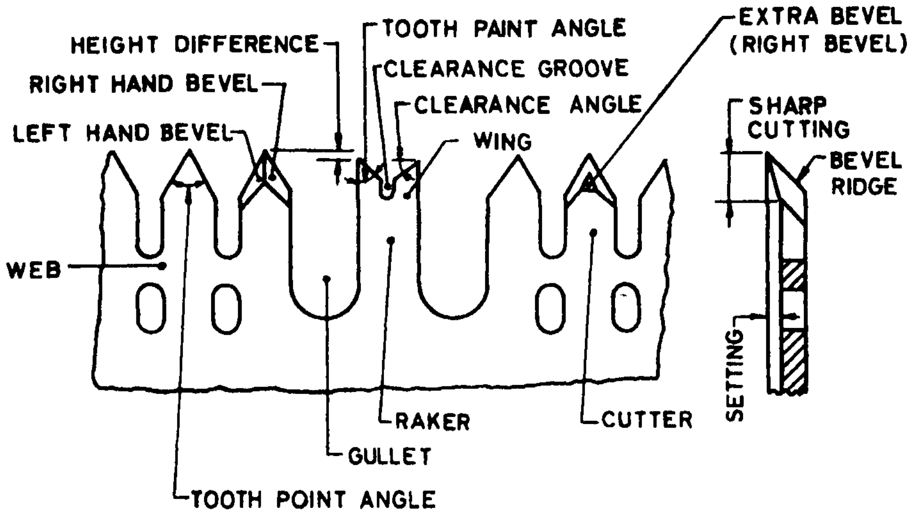


FIG. 2 DETAILS OF RAKER TOOTH

3.10.1 *One-Man Cross Cut Saws*

A saw used by one man for cutting of timber across the grain (*see* Fig. 3).

3.10.2 *Two-Men Cross Cut Saws*

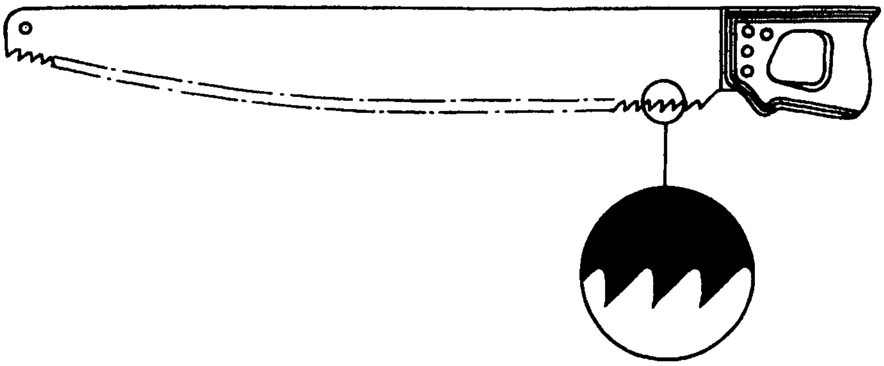
A saw used by two men for cutting of timber across the grain.

3.10.3 *Bow Saw*

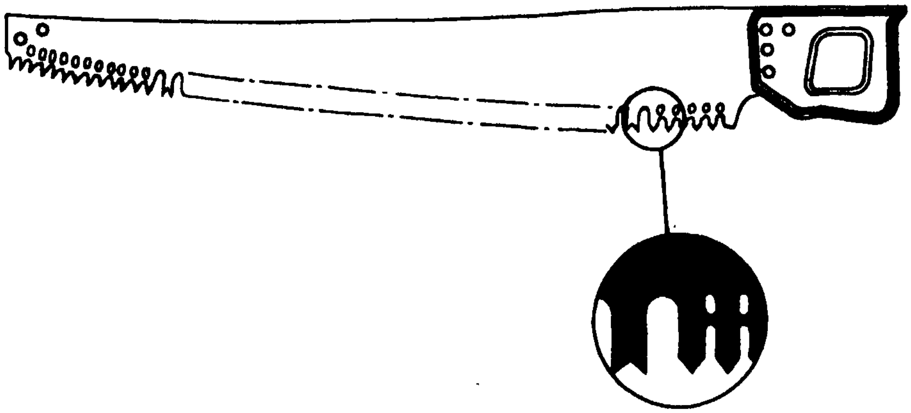
A type of cross cut saw with a thin ribbon like blade held in place by a stiff frame generally of the form of bow (*see* Fig. 4).

3.10.4 *Pit Saw*

A kind of ripping saw used for cutting slab or logs

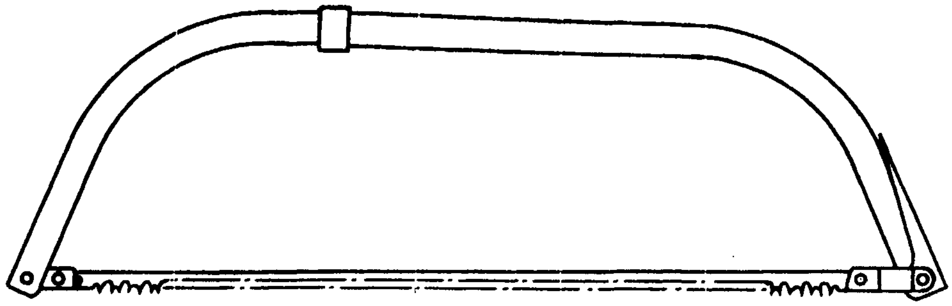


3A Peg Tooth Type

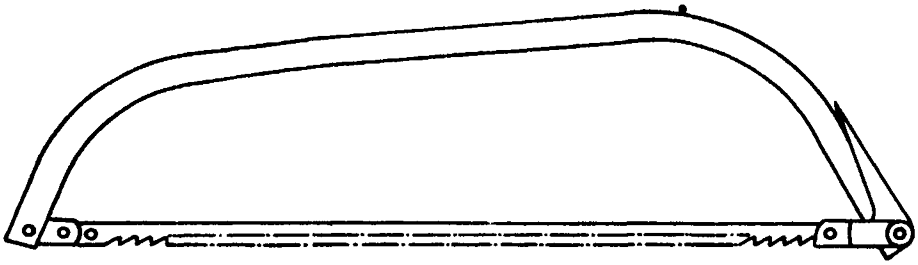


3B Raker Tooth Type

FIG. 3 ONE–MAN CROSS CUT SAW



4A Adjustable Frame Two-Men Type



4B Non-Adjustable Frame One-Man Type

FIG. 4 BOW SAW

along the grain direction over a pit.

3.10.5 *Ripping Saw*

A saw meant for cutting timber along the grain direction.

3.11 Saw Covers

Wooden guards mounted on the cutting edge of saws to prevent accidental damage to saw teeth.

3.12 Setting Iron (Saw Set Key)

A tool used for binding the teeth of saw in the alternate direction so as to obtain the required set.

3.13 Wooden Setting Cat (Saw Setting Gauge)

A tool measuring the degree of set given to the cutting teeth of a saw.

3.14 Set (of Saw Teeth)

The extent to which the teeth are bent or swayed to either side of the plane of the blade.

3.15 Triangular Tooth

See **3.8.**

3.16 Cutters in a Raker Toothed Saw

Cutters meant only to cut off the fibres.

3.17 Raker

Working like chisel, the raker breaks off the fibres and carries them out of the saw.

3.18 Sharpening

Filing of the teeth to improve cutting efficiency of the saw.

4 TYPES OF SAWS AND THEIR RECOMMENDED USES

4.1 *Cross Cut Saw*

4.1.1 *One-Man Cross Cut Saws*

Such saws are to be operated single-handed and are both peg-toothed as well as raker-toothed. The front edge of the teeth of such saw is at right angles to the back of the saw blades.

4.1.2 *Two-Men Cross Cut Saws*

Such saws are to be operated by the sawyers and are of both peg-toothed type as well as raker-toothed type. The requirements of these saws are covered in IS 12137.

4.1.3 These saws are used for cross cutting of logs, felling of trees, etc.

4.1.4 The following standard lengths of saws are recommended for different diameters of the logs to be cross cut/trees to be felled:

Length of the Saw	*Diameter of the Log to be Cross Cut or Tree to be Felled*
mm	mm
1 300	200 to 300
1 500	301 to 600
1 800	601 to 1 000
2 400	1 001 to 1 400
3 000	Above 1 400

4.2 Ripping Saws

4.2.1 *Frame Saw*

This type of saw consists of a saw blade fitted in a light wooden or a bamboo frame worked by two persons at a time (*see* Fig. 5). The gauge of the saw is between 14 and 16 SWG.

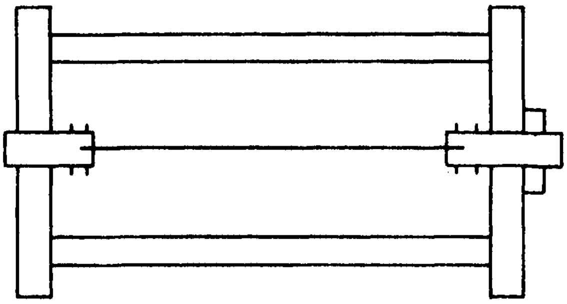


FIG. 5 FRAME SAW

4.2.2 *Pit Saw*

It is a long heavy saw (*see* Fig. 6). The most common length of the saw is 1 850 mm. The gauge of the saw is between 12 and 14 SWG.

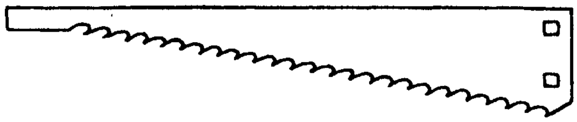


FIG. 6 PIT SAW

4.3 Bow Saw

Such saws are both peg-toothed type as well as raker-toothed type. The requirements of bow saw frame are covered in IS 11250 whereas IS 11251 lays down the requirements of bow saw blades. However, IS 11251 specifies only peg-toothing. The bow saw blades require sharpening when become blunt. Bow saw can be operated by one-man or by two-men depending upon its size and shape.

5 ACTION OF SAWS

5.1 The action of a saw may be classified as follows:

- a) To cut off the fibres,
- b) To break off the fibres which have been cut off, and
- c) To carry away the fibres or saw dusts, out of the kerf.

5.2 Each tooth on a peg-toothed saw performs all the three actions. In case of raker-toothed saws, these three actions are distributed between the cutters and the rakers making the saw more efficient.

6 MAINTENANCE OF SAWS

6.1 General

To keep the saws in efficient working order, it shall be necessary to keep the cutting edge of the teeth of a saw clean, free of rust and well-sharpened.

6.2 Protection Against Rust

Saw blades shall be stored in a dry place to prevent rusting. Whenever necessary, these shall be rubbed regularly with grease or kerosene oil. Saws shall not be kept on the floor or on the ground in the field.

6.3 Protection Against Damage

The saws when carried to work or brought to the store shall be protected with saw-guards.

6.4 Frequency of Sharpening

Saws shall be sharpened generally every day or alternate day after full days work, but frequency of sharpening will depend on the quality of saw, accuracy with which maintenance has been done, species sawn and sawing condition, that is, presence of mud or sand in the log or tree. If tree cut is hallowed having mud, sand, etc, the saw requires maintenance after the work because sharpness of the teeth is affected and setting changed due to friction.

6.5 Requirements for Proper Maintenance of Saws

6.5.1 *Working Place*

The saws shall be sharpened and cleaned in a well lighted working place.

6.5.2 *Tools Required for Proper Maintenance*

6.5.2.1 *Maintenance tools required for two-men cross cut saw (peg-toothed type)*

- a) Wooden filing vice as per IS 13821,
- b) Wooden jointer as per IS 12413 for equalising the teeth heights,
- c) Flat file with round edges as per details given below for sharpening the teeth (*see* Fig. 7):

Length	200 mm
Width	21 mm
Thickness	3.25 mm
No. of cuts	22 cuts (single cut) per cm

- d) 200 mm round file of 5.5 mm diameter with 22 cuts per cm for gulleting,

e) File cleaner,

f) File handle,

g) Setting iron (steel saw set key) as per IS 12412 for alternative setting of the saw teeth,

h) Wooden setting cat (saw setting gauge) as per IS 12515 for measuring the setting done, and

j) Whet stone for removing the burrs.

6.5.2.2 *Maintenance tools required for two-men cross cut saw (raker-toothed type)*

a) Wooden filing vice as per IS 13821,

b) Wooden jointer as per IS 12413,

c) Flat file as per details given at **6.5.2 1** (c),

d) Round file 200 mm, diameter 10 mm with 14 cuts (single cut) per cm for gulleting,

e) File cleaner,

f) File handle,

g) Raker adjuster-cum-setting iron as per IS 12652,

h) Setting anvil as per IS 12651,

j) Setting hammer as per IS 12697,

k) Wooden setting cat as per IS 12515, and

m) Whet stone for removing the burrs.

6.5.2.3 *Maintenance tools required for bow saw blades*

a) Wooden filing vice as per IS 13821,

b) Wooden jointer as per IS 12704,

c) 150 mm flat file, width 11 mm, thickness 2 mm with 22 cuts (single cut) per cm for sharpening and gulleting,

d) File cleaner,

e) File handle,

f) Setting plier as per IS 12696,

g) Wooden setting cat as per IS 13379, and

h) Whet stone for removing burrs.

6.6 Recommended Practices for Proper Sharpening of Saws

6.6.1 *Clamping of Saw Blades*

Before the saws are sharpened or filed, the saw shall be kept firm in a proper clamp. Sometimes, notches are also cut into small pegs which are driven in level ground or into the stumps in the forest area and the saw blades are pushed into these. This method of clamping is recommended only when it can hold the blade correctly and firmly. Wooden filing vice as per IS 13821 is recommended for holding/clamping the saw for maintenance/sharpening.

6.6.2 *Jointing*

The saw shall then be jointed, that is, the teeth of the saw shall be brought to same working level with the help of wooden jointer. Wooden jointer for two-men cross cut saw as per IS 12413 and for bow saw blades as per IS 12704 is recommended. The wooden jointer for two-men cross cut saw can be used for both peg-toothed and raker–toothed saw.

6.6.3 *Sharpening of Saws*

The sharpening of saw shall be done by means of files which shall be placed at the required angle on the teeth and worked in the forward direction. The filing vice shall have marking on its clamps to indicate the direction of sharpening. The following are the recommended angles at which sharpening of saws may be done :

a) Two-men cross cut saw

   i) Peg-toothed saw — 60° to 70° with half bevel angle

   ii) Raker-toothed saw — 40° to 50° with full bevel angle

b) Bow saw blade — 40° to 50° with half bevel angle

6.6.4 *Setting of the Teeth*

For allowing the free movement of the saw in the while cutting, the teeth of the saw are set by bending every alternative cutting tooth to the opposite side. Setting is done in order to prevent the saw from bending or running heavily. The setting shall be same for all teeth. Setting depends upon the type of species sawn. It is experienced that saw setting for sawing softer species is more than for sawing harder species.

6.6.4.1 The amount of set depends on the type of saw

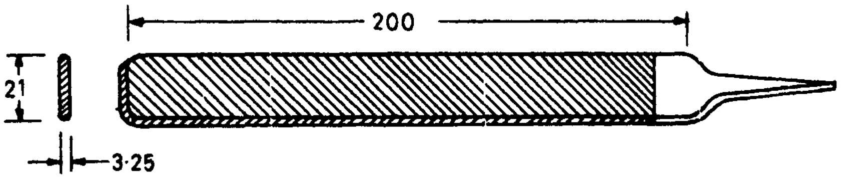


FIG. 7 FLAT FILE

teeth and the hardness of timber. The following are the recommended degree of set:

	Coniferous Wood	*Non-Coniferous Wood*
Peg-tooth	0.30 to 0.50 mm	0.20 to 0.35 mm
Raker-tooth	0.25 to 0.40 mm	0.15 to 0.25 mm

For peg-toothed saw a setting key shall be used, whereas for raker-toothed saw a hammer and anvil shall be used for giving the set. The same set shall be given to all the teeth.

6.6.5 The base of gullets of the saw shall be filed with a flat file having round edges. This helps in providing enough space for the removal of saw dust and also in retaining the original shape of the saw teeth.

6.6.6 *Lowering the Rakers*

The raker breaks and remove the fibres cut by cutters from the kerf in case of two-men cross cut saw with raker-toothing. To do this function and to prevent the rakers from cutting the fibres, the raker shall be shorter than the cutter. The difference in height between cutter and raker as shown at Fig. 2 depends upon the hardness of species of wood to be sawn. The exact amount of lowering the raker for particular species is learnt by experience. However, for coniferous timbers the height difference between the cutters and rakers is 0.40 to 0.70 mm. For non-coniferous timber this value is between 0.20 to 0.40 mm. The height difference between raker and cutter shall be adjusted with a tool known as raker adjuster-cum-setting iron for two-men cross cut saw (*see* IS 12652).

7 GENERAL PRINCIPLES OF CONVERSION OF LOGS DURING HAND-SAWING

7.1 Before starting conversion, the log shall be examined in respect of its length, etc, to ascertain if the log is suitable for conversion to the required sizes. It shall also be examined in respect of end-defects and centre-heart so that maximum yield is obtained from the log.

7.2 After the first slab has been removed, the log shall be re-examined to see if penetration of the end-defects do not result in excessive wastage. The log shall be then sawn into planks or scantlings as required.

7.3 Logs more than 4.5 m in length shall be cut into two or three pieces according to the lengths of the required plank and scantlings; or according to the curvature in the log.

8 FACTORS INFLUENCING OUTTURN OF SAWN TIMBER DURING CONVERSION

8.1 The percentage out turn of sawn timber in conversion of logs depends on the factors given in **8.1.1** to **8.1.6**.

8.1.1 *Defects*

Visible such as knots, flutes, twist, uneven surface, borer holes, splits and other such defects which considerably reduce the out turn of sawn material.

8.1.2 *Shape of Logs*

Straight and cylindrical logs give higher yield than those with pronounced taper and curved appearance.

8.1.3 *Size of Logs*

Logs of large diameters and long lengths give greater percentage out turn.

8.1.4 *Sawing Equipment*

The type of saw used influences the finish and also percentage out turn.

8.1.5 *Skill and Judgement of the Sawyer*

The same log may yield different quantities of sawn timber depending upon the skill and judgement of the sawyer.

8.1.6 *Sizes of the Sawn Material*

Production of smaller section and thinner planks leads to greater wastage than the production of larger sections and thicker planks.

8.1.6.1 The following is an indication of the approximate percentage out turn of sawn timber in the conversion of sleepers and logs to planks and scantlings:

a) Sleepers of size 25 cm × 15 cm to planks 25 mm thick — 85 to 90,
b) Sleepers of size 25 cm × 15 cm to scantlings 75 mm × 60 mm — 90 to 95,
c) Logs of approximate 120 cm into planks 25 mm thick — 50 to 70,
d) Logs of approximate 120 cm to scantlings 75 mm × 60 mm — 60 to 75.

9 COMMON SAWING DEFECTS AND THEIR CAUSES

9.1 Sawing is Heavy

The causes for heavy sawing are as under:

a) Too little setting for a type of wood,
b) Saw is rusted or coated with deposits,
c) Large burrs have been left on the tooth points, and
d) Saw is not straight or have kinks.

9.2 Saw Runs Easily but Cuts Badly

The causes for this defect are as under:

a) Teeth are too blunt,
b) Gullets are too small making the saw dust to clog,
c) Teeth are not filed to a sharp point.

9.3 Saw Cuts Roughly and Jumps in a Kerf

The causes for this defect are as under:

a) Occassional teeth are too high,
b) Setting is uneven,
c) In raker toothed saw raker are too high.

9.4 Saw Cuts Crookedly

the causes for this defect are as under:

a) Large setting on one side;
b) In correct jointing or filing has made the teeth higher on one side of the blade;
c) Tooth point angle and bevel width not same on both sides;
d) Low tension on blade in case of bow saw;
e) The cutting runs crooked, if much pressure is given on the blade while sawing.

10 GENERAL INSTRUCTIONS ON USE AND CARE OF FILES USED FOR MAINTENANCE OF SAWS

10.1 Use of Files

10.1.1 Before using the file, it shall be fitted with proper handle.

10.1.2 Only recommended file for the type of saw as specified in **6.5.2** is to be used.

10.1.3 The saw to be maintained shall be secured firmly as vibrations destroy the file.

10.1.4 File shall be used slowly and with uniform speed.

10.1.5 Light and uniform pressure shall be applied as teeth of the file cut with light pressure only.

10.1.6 The file shall be used in forward direction only.

10.1.7 The entire length of the file shall be used.

10.1.8 Bigger file shall not be forced in a smaller gullet as it spoils the file teeth.

10.2 Care of Files

10.2.1 The teeth of the files shall be protected by keeping it wrapped in cloth. The files shall not be kept together.

10.2.2 Presence of oil or fatty material is not desirable on files. This can be removed by rubbing chalk or charcoal and then cleaning with wire brush.

11 CARE OF SAWS

11.1 The saws shall be cleaned for rust spots and deposits before maintenance. It can be best done with a piece of cloth dipped in kerosene or hot water. With a layer of rust, setting may be uneven.

11.2 When saw is newly sharpened, it is preferred that the same shall be used on a soft wood for sawing 0.25 to 0.50 m^2 before sawing on hard wood.

11.3 When the saw is stored for couple of days, it shall be applied a coat of oil to prevent rusting.

11.4 The maintenance of saws shall never be postponed as the blunt saws consume more energy and time resulting in less output.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
707 : 1976	Glossary of terms applicable to timber technology and utilization (*second revision*)
11250 : 1985	Bow saw frame
11251 : 1985	Bow saw blades
12127 : 1987	Two-men cross cut saws
12412 : 1988	Setting iron for two-men cross cut saws
12413 : 1988	Wooden jointer for two-men cross cut saws
12515 : 1988	Wooden setting cat for two-men cross cut saws
12651 : 1989	Forestry tools-setting anvil for raker toothed two-men cross cut saws
12652 : 1989	Raker adjuster-cum-setting iron
12696 : 1989	Setting pliers, bow saw blades
12697 : 1989	Forestry tools-setting hammer for raker toothed two-men cross cut saws
12704 : 1989	Wooden jointer for bow-saw blades
13379 : 1992	Forestry tools-wooden setting cat for bow saw blades
13821 : 1993	Forestry tools-wooden filing vice

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Timber Sectional Committee, CED 9

Chairman
SHRI S. SHYAM SUNDER
2989/D, 12th Main, Hal II Stage,
Bangalore 560008

Members	*Representing*
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SHRI A. K. BANSAL SHRI K. DAMODARAN (*Alternate*)	Indian Plywood Industries Research & Training Institute, Bangalore
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CHIEF CONSERVATOR OF FORESTS ADDL CHIEF CONSERVATOR OF FORESTS (*Alternate*)	Forest Department, Government of Uttar Pradesh, Lucknow

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Shri K. S. Lauly Shri P. T. S. Menon (*Alternate*)	Indian Plywood Manufacturing Co Ltd, Mumbai
Shri B. A. Mathews	Forest Department, Andaman & Nicobar Islands, Port Blair
Shri A. Mukherjee Shri A. K. Agarwal (*Alternate*)	Directorate of Standardization, New Delhi
Dr A. N. Nayer	In personal capacity *(C-59, Inderpuri, New Delhi 110012)*
Shri R. C. Prasad Shri B. M. Prasad (*Alternate*)	Bihar State Forest Development Ltd, Patna
President Executive Director (*Alternate*)	Federation of Indian Plywood and Panel Industry, New Delhi
Shri S. S. Rajput	Convener, Timber Terminology and Classification Subcommittee, CED 9:1;Timber Testing Subcommittee, CED 9:9; and, Timber Conversion and Grading, Sub-committee, CED 9:10
Shri B. B. Shambarkar Shri A. K. Agarwal (*Alternate*)	Engineer-in-Chief's Branch, New Delhi
Shri S. N. Sharma	Convener, Timber Seasoning and Treatment Subcommittee, CED 9:3
Shri K. S. Shukla	Forest Research Institute, Forest Products Division, Dehra Dun
Shri N. M. Walecha Shri Anand Prakash (*Alternate*)	Directorate General of Civil Aviation, New Delhi
Shri Vinod Kumar, Director (Civ Engg)	Director General, BIS *(Member)*

Member Secretary
Shri T. B. Narayanan
Joint Director (Civ Engg)

(*Continued on page* 10)

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Timber Conversion and Grading Subcommittee, CED 9:10

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